DICOM Conformance Statement

Product Name: *syngo*^{TM} Ultrasound Breast Analysis (sUSBA)

Release: VA40

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https://www.siemens.com/DICOM

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1 Introduction

This DICOM conformance statement specifies the behavior and functionality of *syngo*.Ultrasound Breast Analysis application, version VA40A. This software provides the following capabilities:

- Reads and displays compressed and uncompressed DICOM images.
- Sends and receives DICOM objects via the DICOM Storage Service Class.
- Supports the DICOM Query/Retrieve Service Class.

1.1 Abbreviations and Acronyms

ASCII	American Standard Code for Information Interchange
AE	Application Entity
ANSI	American National Standards Institute
CR	Computed Radiography
CT	Computed Tomography
DCMTK	OFFIS DICOM Toolkit
DICOM	Digital Imaging and Communications in Medicine
ECR	European Congress of Radiology
GSPS	Grayscale Softcopy Presentation State
HIMSS	Healthcare Information and Management Systems Society
IE	Information Entity
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
ISO	International Standards Organization
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
RSNA	Radiological Society of North America
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
SR	Structured Reporting
TCP/IP	Transmission Control Protocol / Internet Protocol
TLS	Transport Layer Security
UID	Unique Identifier
VM	Value Multiplicity
VR	Value Representation

1.2 Scope

This DICOM Conformance Statement documents the conformance of *syngo*.Ultrasound Breast Analysis software with the Digital Imaging and Communications in Medicine (DICOM) standard. This document is essential in order to evaluate whether or not another DICOM compliant device can communicate with this software product. This statement is conformant with the recommended format as described in PS 3.2 of the DICOM standard.

1.3 Warning to the reader

If another device matches this Conformance Statement based on the comparison with its own Conformance Statement, there is a chance, but no guarantee that they interoperate. DICOM only deals with communication; it is not a standard which specifies what is needed for certain applications to run on a device.

2 Implementation Model

2.1 Application Data Flow Diagram

syngo.Ultrasound Breast Analysis consists of a set of parallel, communicating but independent processes that deal with the DICOM communication. There is a process that takes care of receiving the images (C-STORE SCP) and storing them in the database, and one that sends images out on request (C-STORE SCU). From a functional perspective, the processes that implement *syngo*.Ultrasound Breast Analysis's DICOM network interface can be separated into the application entities: Store SCP, Store SCU, Find SCU, Move SCU and Echo SCU. The application entity titles attached to the different application entities are freely configurable.

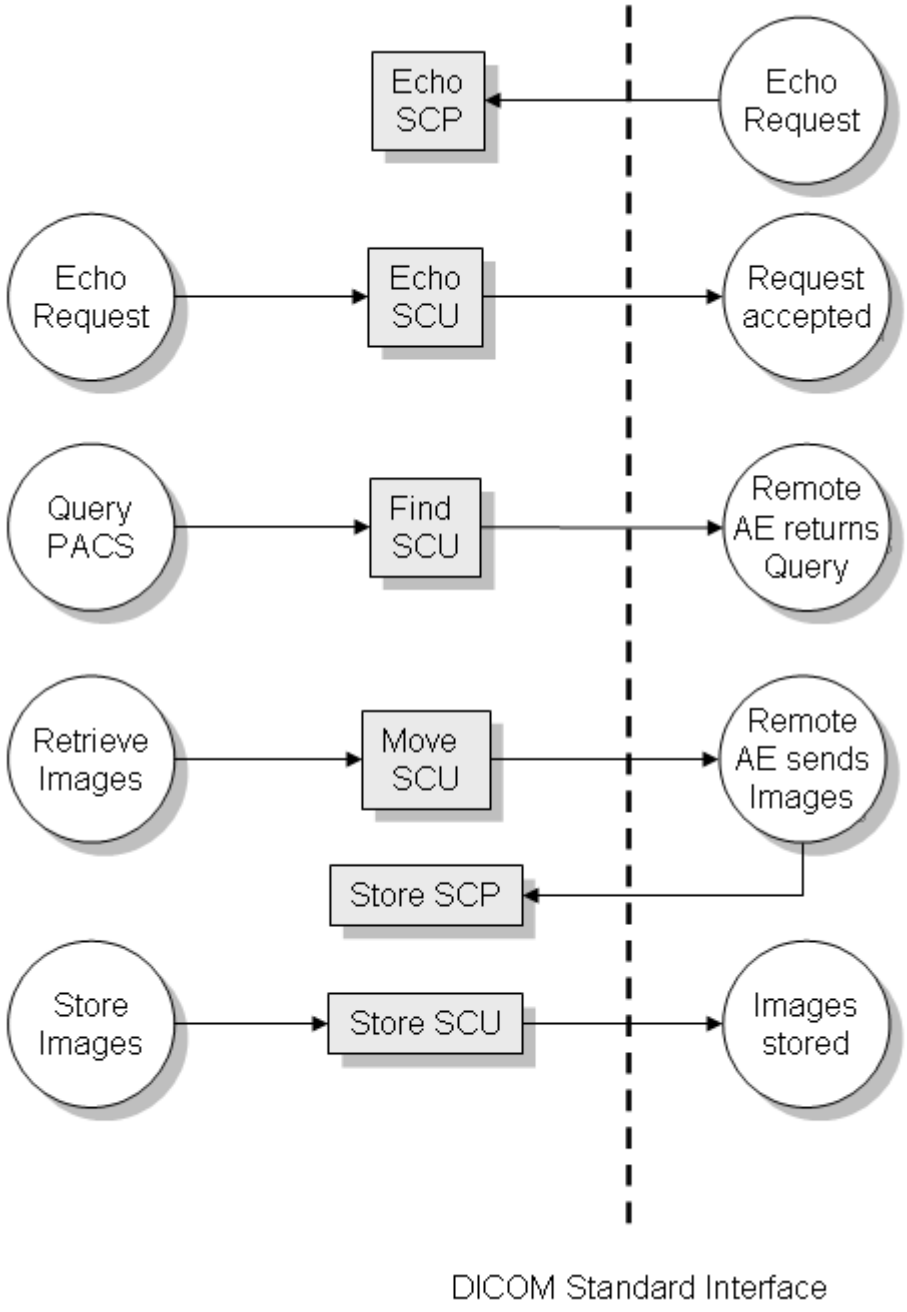

Figure 1: Implementation Model

2.2 Functional Definitions of AEs

2.2.1 Store SCP

StoreSCP is an application that implements the DICOM Storage Service Class and the Verification Service Class as SCP (). StoreSCP is automatically started together with the operating system in a stand-alone system or on the server of a client/server system. StoreSCP spawns a new process for each incoming DICOM association request. The association remains open until the remote application entity closes the association or until an error condition occurs that leads to an association abort.

2.2.2 Store SCU

StoreSCU is an application that implements the DICOM Storage Service Class as SCU. StoreSCU is activated by *syngo*.Ultrasound Breast Analysis whenever the user requests transmission of one or more objects from the local database to a remote node. When *syngo*.Ultrasound Breast Analysis is terminated, StoreSCU continues to transmit until the transmission is completed or aborted because of a fatal error. For each transmission request a separate StoreSCU process is spawned. A transmission request may consist of the transmission of a single image, a complete series or study or several studies. All objects comprising one transmission request are transmitted over one association. When the transmission is finished, the association is released and StoreSCU terminates. If the transmission of an object fails because the peer Store SCP provider sends back an error code or no valid presentation context for the transmission of the object is available, the association is aborted and StoreSCU also terminates.

2.2.3 Query/Retrieve SCU

syngo.Ultrasound Breast Analysis application implements the Query/Retrieve Service Class. It only supports query functionality using the C-FIND message. It sends query keys to an SCP and awaits responses. The application can be used to test SCPs of the Query/Retrieve Service Classes. The functionality is activated by *syngo*.Ultrasound Breast Analysis whenever the user queries for objects at a remote node. A query request starts on patient or patient/study level (depending on the configured query information model) and then can be refined to the series level (first get patient and study information, then series information). For patient root information model, a separate query on study level will be performed for each patient. Query requests on series level will trigger separate queries for each study/series.

2.2.4 Move SCU

MoveSCU is an application which implements both an SCU for the Query/Retrieve Service Class and an SCP for the Storage Service Class. MoveSCU supports retrieve functionality using the C-MOVE message. It sends query keys to an SCP and awaits responses. It will accept associations for the purpose of receiving images sent as a result of the C-MOVE request. The MoveSCU application can initiate the transfer of images to a third party or can retrieve images to itself. Note that the use of the term "move" is a misnomer. The C-MOVE operation actually performs an image copy (no images will be deleted from the SCP). MoveSCU is activated by *syngo*.Ultrasound Breast Analysis when retrieving data from a remote node or when choosing to send data from one remote node to another remote node. When *syngo*.Ultrasound Breast Analysis terminates, Move SCU continues to transmit until the transmission is completed or aborted because of a timeout or fatal error.

2.2.5 Echo SCU

EchoSCU is an application that implements the Verification Service Class as an SCU. It allows checking the availability of remote AEs from the network configuration tool.

3 Application Entity Specifications

3.1 Store SCP

The storescp application supports the following SOP Classes as an SCP:

SOP Class Name	SOP Class ID
BreastTomosynthesisImageStorage	1.2.840.10008.5.1.4.1.1.13.1.3
CTImageStorage	1.2.840.10008.5.1.4.1.1.2
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1
EnhancedMRColorImageStorage	1.2.840.10008.5.1.4.1.1.4.3
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1
EnhancedUSVolumeStorage	1.2.840.10008.5.1.4.1.1.6.2
MRImageStorage	1.2.840.10008.5.1.4.1.1.4
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1
VerificationSOPClass	1.2.840.10008.1.1
RETIRED_UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6

3.1.1 Association Policies

3.1.1.1 General

The DICOM standard application context name, which is always proposed, is:

Application context name 1.2.840.10008.3.1.1.1
The maximum PDU length is 16384 bytes.

SOP Class extended negotiation is not supported.

3.1.1.2 Number of Associations

The number of parallel associations is only limited by the resources of the underlying operating system.

3.1.1.3 Asynchronous Nature

Asynchronous mode of operation is not supported.

3.1.1.4 Implementation Identifying Information

The implementation Class and Version of this application are:

Implementation Class UID 1.2.276.0.7230010.3.0.3.6.1
Implementation Version Name OFFIS_DCMTK_361

3.1.2 Association Initiation Policy

This application entity never initiates associations.

3.1.3 Association Acceptance Policy

When StoreSCP accepts an association, it will respond to storage requests. It places no limitations on who may connect to it, nor on the number of simultaneous connects it will support.

3.1.3.1 Real-World Activity "Receive Storage Request"

The Store SCP application entity accepts an association when it receives an association request from a remote DICOM Storage. The application accepts incoming association requests on the port number defined in the DICOM configurator, if the called AET matches the respective entry in its DICOM configuration. It accepts any association for which at least one presentation context is accepted. The calling application entity title is ignored. The responding application entity name can be configured in the DICOM configurator.

3.1.3.1.1 Associated Real-World Activity

The associated Real-World Activity associated with the C-STORE operation is the storage of the image on the disk of the system upon which Store SCU is running. The data received is then added to a database and analyzed and processed for proper viewing out of the scope of this document.

3.1.3.1.2 Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Image SOP Classes (See table above)		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70	SCP	None
Non-Image SOP Classes (see table above)		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

The default behavior can be changed in the configuration file such that some transfer syntaxes are not accepted.

3.1.3.1.2.1 SOP Specific Conformance for all Storage SOP Classes

The Store SCP will receive any DICOM objects (images and non-image objects) transmitted in the open association provided that the correct presentation context is used. If the objects are received successfully, they are stored and registered in the local database, from where they can be loaded into *syngo*.Ultrasound Breast Analysis. No integrity checks of the received objects are performed beyond tests of a very basic structural integrity. In particular, the sending system is not prevented from transmitting incomplete or incorrect IODs or objects that are correct but cannot be displayed. Such objects will be visible in the patient browser, but they cannot be viewed.

Objects are stored in the local database as files in DICOM part 10 format with Explicit VR Little Endian Transfer Syntax. When objects received in Implicit VR contain attributes unknown to this application, they are stored as “Unknown VR” (UN) elements. Certain element values may be changed during storage, i. e. group length values and sequence lengths are re-computed.

The following error/warning status codes can be sent by StoreSCP in the context of a CSTORE- RSP message:

Code	Name	Severity	Description
a700	refused: out of resources	failure	Application out of memory, file system or database write error (e. g. file system full)
a800	refused: SOP class not supported	failure	Received C-STORE-RQ for non-storage SOP class
a900	error: data set does not match SOP class	failure	SOP class or instance UID in C-STORE-RQ does not match UIDs in the received dataset
c000	error: cannot understand	failure	Received dataset without SOP class or instance UID; received Presentation State that failed syntax check; internal application error

The Store SCP never removes, coerces or changes attribute values, except for the special case of group length attributes mentioned above. The duration of storage depends on the user, who can delete objects from the local database at any time and on the configuration of the storage database, that can be configured to auto-delete studies after a given time.

The Store SCP implements Level 2 (Full) conformance to the Storage Service Class. Store SCP implements Signature Level 3 conformance since the integrity of incoming Digital Signatures is preserved even if “bit preserving mode” is not activated. However, extended negotiation is not supported.

3.1.3.1.3 Transfer Syntax Selection Policies

The default behavior of the Store SCP is to select the explicit VR transfer syntax with the byte order matching the local machine byte order (i. e. little endian on PC) for each presentation context containing a supported SOP class. If this transfer syntax is not available, the explicit VR transfer syntax with the opposite byte order is selected. If this is also unavailable, Implicit VR little endian is selected if available, otherwise the presentation context is rejected.

3.2 Store SCU

The Store SCU application supports the following Storage SOP Classes as an SCU:

SOP Class Name	SOP Class ID
BreastTomosynthesisImageStorage	1.2.840.10008.5.1.4.1.1.13.1.3
CTImageStorage	1.2.840.10008.5.1.4.1.1.2
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1
EnhancedMRColorImageStorage	1.2.840.10008.5.1.4.1.1.4.3
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1
EnhancedUSVolumeStorage	1.2.840.10008.5.1.4.1.1.6.2
MRImageStorage	1.2.840.10008.5.1.4.1.1.4

SOP Class Name	SOP Class ID
BreastTomosynthesisImageStorage	1.2.840.10008.5.1.4.1.1.13.1.3
CTImageStorage	1.2.840.10008.5.1.4.1.1.2
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1
EnhancedMRColorImageStorage	1.2.840.10008.5.1.4.1.1.4.3
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1
EnhancedUSVolumeStorage	1.2.840.10008.5.1.4.1.1.6.2
MRImageStorage	1.2.840.10008.5.1.4.1.1.4
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1
RETIRED_UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6

This application entity does not provide standard conformance to any SOP class as SCP.

Note: Results generated by the application are stored and sent out as Secondary Capture Images or Multiframe True Color Secondary Capture Images (clips).

3.2.1 Association Establishment Policies

3.2.1.1 General

The DICOM standard application context name, which is always proposed, is:

Application context name	1.2.840.10008.3.1.1.1

The maximum PDU length is 16384 bytes.

SOP Class extended negotiation is not supported.

3.2.1.2 Number of Associations

StoreSCU will only propose a single association. However, multiple instances of StoreSCU may be running at the same time. The number of parallel instances is only limited by the resources of the underlying operating system.

3.2.1.3 Asynchronous Nature

Asynchronous mode of operation is not supported.

3.2.1.4 Implementation Identifying Information

The implementation Class and Version of this application are:

Implementation Class UID	1.2.276.0.7230010.3.0.3.6.1
Implementation Version Name	OFFIS_DCMTK_361

3.2.2 Association Initiation by Real-World Activity

3.2.2.1 Real-World Activity “Image transmission”

An instance of the Store SCU application entity is started in order to execute a transmission request. The application initiates an association with the selected remote Storage SCP. The calling application entity name can be configured. The called application entity name must be configured together with the related host name or address in the DICOM configurator.

3.2.2.1.1 Associated Real-World Activity

There are two ways to start a file transfer:

- *syngo*.Ultrasound Breast Analysis Browser: The user selects an object, series or study in the patient browser. He selects the “send“ function, chooses a send target and selects “OK”.
- Result Storage: The result images or presentation contexts generated within the viewing application can be sent to an arbitrary known C-STORE SCP by the user or are sent to the C-STORE SCP that is marked as “Default PACS” in the DICOM configuration on completion of a study.

3.2.2.1.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Secondary Capture SOP Classes (See table above)		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70	SCU	None
UltraSound Image Storage		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70	SCU	None

The explicit VR transfer syntax with local byte order (i.e. little endian on PC) will always be the first in the list of the proposed transfer syntaxes, followed by the explicit VR transfer syntax with the opposite byte order, followed by the DICOM default transfer syntax.

3.2.2.1.2.1 SOP Specific Conformance for all Storage SOP Classes

StoreSCU transmits the selected objects from the local *syngo*.Ultrasound Breast Analysis data storage and creates a log entry for each C-STORE operation. The log entry shows whether or not the transmission was successful. If the SCP returns a DIMSE error or warning status code for one C-STORE operation, this information is logged, and transmission continues with the next object. Store SCU never attempts to automatically repeat failed transmissions. If transmission of one selected object fails because no appropriate presentation context could be negotiated, StoreSCU aborts the association and creates a log entry indicating the unsuccessful termination. StoreSCU always transmits all elements contained in an object, independent from their type within the IOD of the corresponding SOP Class.

3.2.3 Association Policies

This application does not accept associations.

3.3 Query/Retrieve SCU

The *syngo*.Ultrasound Breast Analysis application supports the following SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Patient Root Query Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1

3.3.1 Association Establishment Policies

3.3.1.1 General

The DICOM standard application context name, which is always proposed, is:

Application context name 1.2.840.10008.3.1.1.1
The maximum PDU length is 16384 bytes.

SOP Class extended negotiation is not supported.

3.3.1.2 Number of Associations

syngo.Ultrasound Breast Analysis will only propose a single association.

3.3.1.3 Asynchronous Nature

Asynchronous mode of operation is not supported.

3.3.1.4 Implementation Identifying Information

The implementation Class and Version of this application are:

Implementation Class UID 1.2.276.0.7230010.3.0.3.6.1
Implementation Version Name OFFIS_DCMTK_361

3.3.2 Association Initiation by Real-World Activity

3.3.2.1 Real-World Activity “Query remote AE”

In order to execute a query request, the application initiates an association with the selected remote Storage SCP. The calling application entity name can be configured. The called application entity name must be configured together with the related host name or address in the DICOM configurator.

3.3.2.1.1 Associated Real-World Activity

A query request is started within the *syngo*.Ultrasound Breast Analysis patient browser by querying for certain keys. These keys can be set in the browser.

3.3.2.1.2 Proposed Presentation Contexts

The default behavior of the Find SCU is to propose for each of the supported SOP classes a single presentation context containing the following transfer syntaxes:

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
See table above		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

The explicit VR transfer syntax with local byte order (i. e. little endian on PC) will always be the first in the list of the proposed transfer syntaxes, followed by the explicit VR transfer syntax with opposite byte order, followed by the DICOM default transfer syntax.

No extended negotiation is performed. In particular, relational queries are not supported.

3.3.2.1.3 SOP Specific Conformance to C-FIND SOP Classes

FIND-SCU provides standard conformance to the supported C-FIND SOP Classes.

All queries are initiated at the highest level of the information model (the STUDY or PATIENT level, depending of the Query Retrieve Information Model configured for the respective SCP), and then for each response received, repeated for the SERIES level.

A CANCEL request is issued if the user aborts a query in the patient browser.

3.3.2.1.4 Specific Character Set used in queries

For all query expressions containing only the ASCII character subset no Specific Character Set attribute (0008,0005) is sent.

In case the query expression cannot be expressed in the ASCII character subset, but can be expressed in the ISO 8859-1 (Latin-1) character set, a Specific Character Set attribute with the value “ISO_IR 100” (Latin-1) is sent in the query.

In all other cases, a Specific Character Set attribute with the value set to “ISO_IR 192” (UTF-8) is sent in the query.

If the FIND SCP application entity is not configured to support the sent encoding, a warning is shown to the user stating that the query result may be incomplete. The setting does not change the issued queries.

Note: For the query result, all character sets stated in chapter 6 of this conformance statement are supported.

3.3.3 Association Acceptance Policy

This application does not accept associations.

3.4 Move SCU

This application entity provides standard conformance to the following DICOM SOP classes as an SCU:

SOP Class Name	SOP Class ID	SCU	SCP
Patient Root Query Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Query Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

3.4.1.1 General

The DICOM standard application context name, which is always proposed, is:

Application context name 1.2.840.10008.3.1.1.1
The maximum PDU length is 16384 bytes.

SOP Class extended negotiation is not supported.

3.4.1.2 Number of Associations

Move SCU will only propose a single association. However, multiple instances of Move SCU may be running at the same time. The number of parallel instances is limited by the resources of the underlying operating system.

3.4.1.3 Asynchronous Nature

Asynchronous mode of operation is not supported.

3.4.1.4 Implementation Identifying Information

The implementation Class and Version of this application are:

Implementation Class UID 1.2.276.0.7230010.3.0.3.6.1
Implementation Version Name OFFIS_DCMTK_361

3.4.2 Association Initiation by Real-World Activity

3.4.2.1 Real-World Activity “Image transmission”

An instance of the Move SCU application entity is started in order to execute a transfer request from a remote host to another host, which can either be another remote host or the local host. The application initiates an association with the selected remote Storage SCP. The calling application entity name can be configured. The called application entity name must be configured together with the related host name or address in the DICOM configurator.

3.4.2.1.1 Associated Real-World Activity

To start a file transfer from the *syngo*.Ultrasound Breast Analysis patient browser, the user selects a series or study from a remote host in the patient browser. He selects the ”retrieve“ function and selects “OK”.

3.4.2.1.2 Proposed Presentation Contexts

The default behavior of the Move SCU is to propose a single presentation context for each of the supported SOP classes containing the following transfer syntaxes:

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
See table above		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

The explicit VR transfer syntax with local byte order (i. e. little endian on PC) will always be the first in the list of the proposed transfer syntaxes, followed by the explicit VR transfer syntax with the opposite byte order, followed by the DICOM default transfer syntax.

3.4.2.1.3 SOP Specific Conformance to C-MOVE SOP Classes

Move SCU provides standard conformance to the supported C-MOVE SOP Classes.

A retrieval will be performed at the PATIENT, STUDY or SERIES level depending on what level has been selected by the user in the browser.

No CANCEL requests are ever issued.

The retrieval is performed from the AE that was specified in the Retrieve AE attribute returned from the query performed by Find SCU.

The instances can be retrieved either to the current application's local database or to another AE by specifying the AE Title of the destination Store SCP. This implies that the remote C-MOVE SCP must be preconfigured to determine the presentation address corresponding to the Store SCP AE. The local Store SCP AE will accept storage requests addressed to it from anywhere, so no pre-configuration of the local application to accept from the remote AE is necessary (except in so far as it was necessary to configure Find SCU).

3.4.3 Association Acceptance Policy

This application does not accept associations.

3.5 Echo SCU/Echo SCP

3.5.1 SOP Classes

This application entity provides standard conformance to the following DICOM SOP classes:

Table 1 Find SCU SOP Classes

SOP Class Name	SOP Class ID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes

3.5.2 Association Policies

3.5.2.1 General

EchoSCU initiates associations. EchoSCP accepts, but never initiates, associations.

The maximum PDU length is 16384 bytes.

SOP Class extended negotiation is not supported.

3.5.2.2 Number of Associations

EchoSCU will only propose a single association.

3.5.2.3 Asynchronous Nature

Asynchronous mode of operation is not supported.

3.5.2.4 Implementation Identifying Information

The implementation UID of this application is:

Implementation Class UID	1.2.276.0.7230010.3.0.3.6.1
Implementation Version Name	OFFIS_DCMTK_361

3.5.3 Association Initiation Policy

3.5.3.1 Real-World Activity “Send Echo Request”

An instance of the EchoSCU application is started when the user initiates a connection test from the DICOM configuration tool. The application initiates an association with a selected remote Verification SCP.

3.5.3.1.1 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

No Extended negotiation is performed.

3.5.3.1.2 SOP Specific Conformance

EchoSCU provides standard conformance to the Verification Service Class.

3.5.4 Association Acceptance Policy

The Verification SCP is part of the StoreSCP application. The StoreSCP application will respond to echo requests when it accepts associations.

4 COMMUNICATION PROFILES

4.1 Supported Communication Stacks
DICOM Upper Layer over TCP/IP is supported.

4.2 OSI Stack
Not supported.

4.3 TCP/IP Stack
The TCP/IP stack is inherited from the underlying operating system.

4.3.1 API
The application makes use of the WinSock interface.

4.3.2 Physical Media Support
DICOM is indifferent to the physical medium over which TCP/IP executes.

4.4 Point-to-Point Stack
Not supported.

5 Configuration

5.1 AE Title / Presentation Address Mapping

The mapping of application entity titles to presentation addresses is configurable during runtime in the Network panel of the Preferences editor, see details below.

5.2 Configurable Parameters

5.2.1 Store SCP

For the Store SCP component, the following parameters are configurable:

- Listening IP port numbers
- Application entity title

The number of listening application entities is not restricted.

5.2.2 Store SCU

For the Store SCU component, the following parameters are configurable for each send target:

- Presentation address (DNS hostname or IP address)
- IP port number
- Called application entity title
- Calling application entity title
- “Default PACS” flag

The number of send targets is not restricted.

5.2.3 Find SCU

For the Find SCU component, the following parameters are configurable for each query target:

- Presentation address (DNS hostname or IP address)
- IP port number
- Called application entity title
- Calling application entity title
- Query/retrieve information model (patient or study root)
- Support of ISO_IR 100 (Latin 1) character set in the query
- Support of ISO_IR 192 (UTF-8) character set in the query

The number of send targets is not restricted.

5.2.4 Move SCU

For the Move SCU component, the following parameters are configurable for each target:

- Presentation address (DNS hostname or IP address)
- IP port number
- Called application entity title
- Calling application entity title
- Query/retrieve information model (patient or study root)

The number of send targets is not restricted.

6 SUPPORT OF EXTENDED CHARACTER SETS

This application supports the following extended character sets:

ISO_IR 100	ISO 8859-1 (Latin 1)
ISO_IR 101 *	ISO 8859-2 (Latin 2)
ISO_IR 109 *	ISO 8859-3 (Latin 3)
ISO_IR 110 *	ISO 8859-4 (Latin 4)
ISO_IR 144 *	ISO-8859-5 (Cyrillic)
ISO_IR 127 *	ISO-8859-6 (Arabic)
ISO_IR 126 *	ISO-8859-7 (Greek)
ISO_IR 138 *	ISO-8859-8 (Hebrew)
ISO_IR 148 *	ISO-8859-9 (Latin 5)
ISO_IR 13 *	JIS_X0201 (Katakana/Romaji)
ISO_IR 166 *	ISO-8859-11 (Thai)
ISO_IR 192 *	UTF-8
GB18030 *	GB18030 (Chinese)

The proper display of character sets marked with "*" is only supported if the underlying operating system supports it.

7 INFORMATION OBJECT IMPLEMENTATION

This section specifies the subsets of DICOM Information Object Definitions (IOD) used to represent the information objects produced by this implementation.

7.1 Secondary Capture Module Table

Entity Name	Module	Reference
Patient	Patient	7.2.1.1
Study	General Study	7.2.1.2
	Patient Study	7.2.1.3
	Study Identification Module	7.2.1.4
	Study Classification Module	7.2.1.5
Series	General Series	7.2.1.6
Equipment	General Equipment	7.2.1.7
	SC Equipment	7.2.1.14
Image	General Image	7.2.1.8
	Image Pixel	7.2.1.9
	SC Image	7.2.1.15
	Overlay Plane	7.2.1.10
	Modality LUT	7.2.1.11
	VOI LUT	7.2.1.12
	SOP Common	7.2.1.13

7.2 Secondary Capture Module Descriptions

7.2.1.1 Patient Module

Attribute Name	Tag	Type	VR	VM	Comment
Patient's Name	(0010,0010)	2	PN	1	Copied from Original
Patient ID	(0010,0020)	2	LO	1	Copied from Original
Patient's Birth Date	(0010,0030)	2	DA	1	Copied from Original
Patient's Sex	(0010,0040)	2	CS	1	Copied from Original

7.2.1.2 General Study Module

Attribute Name	Tag	Type	VR	VM	Comment
Study Instance UID	(0020,000D)	1	UI	1	Copied from Original
Study Date	(0008,0020)	2	DA	1	Copied from Original
Study Time	(0008,0030)	2	TM	1	Copied from Original
Referring Physician's Name	(0008,0090)	2	PN	1	Copied from Original
Study ID	(0020,0010)	2	SH	1	Copied from Original
Accession Number	(0008,0050)	2	SH	1	Copied from Original
Study Description	(0008,1030)	3	LO	1	Copied from Original

7.2.1.3 Patient Study Module

Attribute Name	Tag	Type	VR	VM	Comment
Patient's Age	(0010,1010)	3	AS	1	Copied from Original
Patient's Size	(0010,1020)	3	DS	1	Copied from Original
Patient's Weight	(0010,1030)	3	DS	1	Copied from Original

7.2.1.4 Study Identification Module

Attribute Name	Tag	Type	VR	VM	Comment

Attribute Name	Tag	Type	VR	VM	Comment
Study ID Issuer	(0032,0012)		LO	1	Copied from Original
Other Study Numbers	(0020,1070)		IS	1-n	Copied from Original

7.2.1.5 Study Classification Module

Attribute Name	Tag	Type	VR	VM	Comment
Study Comments	(0032,4000)		LT	1	Copied from Original

7.2.1.6 General Series Module

Attribute Name	Tag	Type	VR	VM	Comment
Modality	(0008,0060)	1	CS	1	Copied from Original / OT (Workarea snapshot and reports)
Series Instance UID	(0020,000E)	1	UI	1	Copied from Original / Generated (Workarea screenshots and reports)
Series Number	(0020,0011)	2	IS	1	Generated
Laterality	(0020,0060)	2c	CS	1	Copied from Original / None (Workarea snapshot and report)
Series Description	(0008,103E)	3	LO	1	Finding information
Operator's Name	(0008,1070)	3	PN	1-n	<full user name>
Body Part Examined	(0018,0015)	3	CS	1	Copied from Original / None (Workarea snapshot and report)
Patient Position	(0018,5100)	2c	CS	1	Copied from Original / None (Workarea snapshot and report)

7.2.1.7 General Equipment Module

Attribute Name	Tag	Type	VR	VM	Comment
Manufacturer	(0008,0070)	2	CS	1	'Siemens Corporation'
Institution Name	(0008,0080)	3	LO	1	<as configured>
Institution Address	(0008,0081)	3	ST	1	None
Station Name	(0008,1010)	3	SH	1	<local hostname>
Institutional Department Name	(0008,1040)	3	LO	1	None
Manufacturer's Model Name	(0008,1090)	3	LO	1	'syngo.Ultrasound Breast Analysis'
Device Serial Number	(0018,1000)	3	LO	1	None
Software Versions	(0018,1020)	3	LO	1-n	'sUSBA 3.0 (<build number>)'

7.2.1.8 General Image Module

Attribute Name	Tag	Type	VR	VM	Comment
Instance Number	(0020,0013)	2	IS	1	Generated
Patient Orientation	(0020,0020)	2c	CS	2	Copied from Original / None (Workarea snapshot and report)
Content Date	(0008,0023)	2c	DA	1	Creation date of Secondary Capture object
Content Time	(0008,0033)	2c	TM	1	Creation time of Secondary Capture object
Image Type	(0008,0008)	3	CS	1-n	'DERIVED\SECONDARY\OTHER\SUSBA'

7.2.1.9 Image Pixel Module

Attribute Name	Tag	Type	VR	VM	Comment
Samples per Pixel	(0028,0002)	1	US	1	'1' – for gray scale value images '3' – for color images
Photometric Interpretation	(0028,0004)	1	CS	1	'MONOCHROME2' – for gray scale value images 'RGB' – for color images
Rows	(0028,0010)	1	US	1	Depending on the size of the image on screen
Columns	(0028,0011)	1	US	1	Depending on the size of the image on screen
Bits Allocated	(0028,0100)	1	US	1	'8'
Bits Stored	(0028,0101)	1	US	1	'8'
High Bit	(0028,0102)	1	US	1	'7'
Pixel Representation	(0028,0103)	1	US	1	'0'
Pixel Data	(7FE0,0010)	1	OW/ OB	1	Always sent as OW
Planar Configuration	(0028,0006)	1c	US	1	'0' – for color images not present otherwise

7.2.1.10 Overlay Plane Module

This module is not implemented for this IOD.

7.2.1.11 Modality LUT Module

This module is not implemented for this IOD.

7.2.1.12 VOI LUT Module

This module is not implemented for this IOD.

7.2.1.13 SOP Common Module

Attribute Name	Tag	Type	VR	VM	Comment
SOP Class UID	(0008,0016)	1	UI	1	Secondary Capture Image Storage: '1.2.840.10008.5.1.4.1.1.7'
SOP Instance UID	(0008,0018)	1	UI	1	Generated
Specific Character Set	(0008,0005)	1c	CS	1-n	ISO_IR 100 / ISO_IR 192 (if needed)

7.2.1.14 SC Equipment Module

Attribute Name	Tag	Type	VR	VM	Comment
Conversion Type	(0008,0064)	1	CS	1	'WSD'
Secondary Capture Device Manufacturer	(0018,1016)	3	LO	1	'Siemens Corporation'
Secondary Capture Device Manufacturers Model Name	(0018,1018)	3	LO	1	'syngo.Ultrasound Breast Analysis'
Secondary Capture Device Software Versions	(0018,1019)	3	LO	1	'sUSBA 3.0 (<build number>)'

7.2.1.15 SC Image Module

Attribute Name	Tag	Type	VR	VM	Comment
Date of Secondary Capture	(0008,1012)	3	DA	1	Creation date of Secondary Capture object
Time of Secondary Capture	(0018,1014)	3	TM	1	Creation time of Secondary Capture object

7.3 Multi-frame True Color Secondary Capture Module Table

Entity Name	Module	Reference
Patient	Patient	7.2.1.1
Study	General Study	7.2.1.2
	Patient Study	7.2.1.3
Series	General Series	7.2.1.6
Equipment	General Equipment	7.2.1.7
	SC Equipment	7.2.1.14
Image	General Image	7.2.1.8
	Image Pixel	7.2.1.9
	Cine	7.3.1.1
	Multi-frame	7.3.1.2
	SC Image	7.2.1.15
	SC Multi-frame Image	7.3.1.3
	SC Multi-frame Vector	7.3.1.4
	SOP Common	7.2.1.13

Note:

- all modules common with the Secondary Capture Module are described in chapter 7.2
- non-mandatory modules that are not present are omitted

7.3.1.1 Cine Module

Attribute Name	Tag	Type	VR	VM	Comment
Preferred Playback Sequencing	(0018,1244)	3	US	1	Set to 0 (Looping)
Frame Time	(0018,1063)	1C	DS	1	Nominal time (in msec) per individual frame, set to 250
Cine Rate	(0018, 0040)	3	IS	1	Number of frames per second, set to 4
Recommended Display Frame Rate	(0008, 2144)	3	IS	1	Recommended frame rate in frames per second, set to 4

7.3.1.2 Multi-frame Module

Attribute Name	Tag	Type	VR	VM	Comment
Number of Frames	(0028,0008)	1	IS	1	Number of frames
Frame Increment Pointer	(0028,0009)	1	AT	1-n	Set to Slice Location Vector (0018,2005)

7.3.1.3 Multi-frame Image Module

Attribute Name	Tag	Type	VR	VM	Comment
Burned In Annotation	(0028,0301)	1	CS	1	Set to YES, if text overlays are burned into the frames (e.g. if they are

					switched on during clip creation), otherwise to NO.
Frame Increment Pointer	(0028,0009)	1	AT	1-n	Set to Slice Location Vector (0018,2005)

7.3.1.4 Multi-frame Vector Module

Attribute Name	Tag	Type	VR	VM	Comment
Slice Location Vector	(0018,2005)	1C	DS	1-n	Relative position in mm for each frame, taken from the original slices